FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 76 Thursday, July 19, 1945 No. 1509

The American Steel Castings Industry

We recently had a visit from Mr. C. W. Briggs, the director of the research activities of the organisation in America which takes care of the co-operative interests of the steelfoundry industry. Perhaps Mr. Briggs is best known in this country for the exceptionally good work he has done on hot-tears, some of which he recorded in a Paper which was presented some two or three years ago on behalf of the American Foundrymen's Association to the Institute of British Foundrymen. We have followed with considerable interest the progress made by the American steelfoundry industry and noted with satisfaction its rapid and substantial growth to exceed the somewhat formidable output attained in Germany in the immediate pre-war years. We asked Mr. Briggs to expound his ideas for a national research organisation so designed as to be of maximum utility for the steel-castings industry. With characteristic American candour the first precept enunciated was that the industry should hire the best technician available and pay him generously. Next this officer would arrange for monthly meetings in each suitable area of all the steelfoundry managers, and learn from them just what types of help they most needed and which were the more urgent. Solutions to some problems are found by the mere exchange of views and, if this be so, then they are recorded and circulated immediately to all members in the form of a bulletin. Published work appearing in current literature is also extracted, and may form the subject of future discussions. Arising from these monthly meetings are problems which require research work for their elucidation. The director then mentally divides these into various categories and he chooses a laboratory—maybe one attached to a members' works; a co-operative research institution such as the Battelle or Mellor, or a University—depending upon the work to be undertaken.

To our mind, this method of working is superior to most, as it relieves executives, councils, committees and sub-committees of the onus of "guessing" what the industry wants. Moreover, it should very effectively tie up research and development, and will certainly reduce the time lag between discovery and industrial applications. Decentralisation in research has much to commend it. In this country, in the allied field of technology, the Institute of British Foundrymen has since its inception rigidly adhered to this policy of taking "science" to an ever-increasing number of centres and has done this with outstanding success. One of these is that, when committees are formed for the study of some special subject, they tend to become committees of the industry rather than sub-committees of the council.

Mr. Briggs confirmed what we had already suspected, and that was that, due to pressure of service requirements, a number of ironfoundries had been converted to steel-casting producing plants. His organisation responded by making every effort to teach these newcomers their new business. Some have been so successful that they have every intention of remaining in the business, whilst others will revert to their original manufactures at the earliest opportunity.

Being realistic, the Americans have devoted much energy, time and money to presenting to designers and buyers the essential information about steel castings in such a form as to win their co-operation for confirming established uses and creating new applications. There is ample evidence that they have successfully "sold" the service authorities and the railway companies. They, like the British, are still faced with the problem of keeping a greatly expanded industry working at reasonable capacity under peace conditions. Their organisation is apparently in splendid trim. Is ours?

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CHAPLET ELIMINATOR

By "TRAMP"

To ensure that cores are secured against movement in the mould during pouring, chaplets or studs are frequently used. Often this method is not permissible because of the risk of a faulty casting appearing on the water pressure test, and other ways have to be devised to hold the core in position. Sometimes this can be accomplished by the use of balance prints, but occasionally some other method is necessary to effect the desired end.

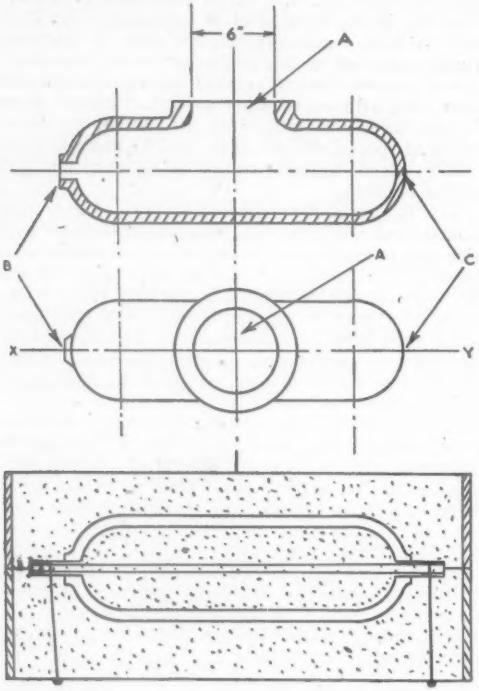

FIG. 1

Fig. 1 (top) shows two views of a casting for a pressure vessel which was to be hydraulically tested to 1,000 lbs. per sq. in. The main outlet for the core is at A, but 1½-in. dia. holes which can subsequently be plugged and welded over are permissible at B and C. Consequently a pattern was made jointed along line X-7 and a core made in a box similarly jointed. On examining the first casting, which had been made in greensand, it was found that the core had shifted, the lift being sufficient to float the core slightly out of centre. As no studs or chaplets had been used on this casting, and none was permissible, it was decided to procure a number of tubes of diameter slightly smaller than that of the end holes B and C, and of the same length as the core, and incorporate these in the core, the method of manufacture of the core being by making the bottom half and embedding the tube—which had a number of holes drilled in to assist venting—and making the top half on the bottom.

As the bottom-half core-box was of metal, the core was dried in this. On assembly, the core was placed in the mould and a wire passed over the ends of the tube projecting into the core seats and down through previously prepared holes at each end. The core was then wired down, as indicated in Fig. 1 (bottom), and all movement was effectively counteracted.

ANGLO-AMERICAN SERVICES EXHIBITION ON PRESERVATION AND PACKAGING

Members of the Institute of British Foundrymen can go along to this extremely important exhibition by writing to Mr. John Bolton, acting secretary, at St. John Street Chambers, Deansgate, Manchester, 3, for invitation cards. It is being staged at the Central Ordnance Depot, Feltham, Middlesex, and it shows how great the ravages are when almost any type of material—including glass—has to be despatched to the Far East. A dozen articles may be sent from the manufacturers in the United Kingdom or America and only one or two be fit for use when delivered at the front.

If members or readers cannot personally visit the exhibition, then we strongly advise them to write to Capt. A. D. Rootes at Feltham for a copy of the brochure, which describes and illustrates just what has happened and will continue, unless the co-operation of industry is assured.

"PASSPORT TO PEACE"

This is the title of a document to be issued to about 5,000 members of the staff of the United Steel Companies, Limited, on their demobilisation from the Services. It is a very human pamphlet and is designed to put ex-Servicemen at their ease. Primarily it allows unhindered entry into the department where the ex-employee previously worked, and then introduces him to the official—an ex-Service man—specially appointed to look after his interests. Finally it draws a picture of the changes that have taken place and of the policy of the firm in respect to returning employees.

MR. R. DEPREZ, who for many years was the hon. secretary of the Belgian foundrymen's association, has now been elected president.

DR. JAMES MACKENZIE, of the American Cast Pipe Company, of Birmingham, Alabama, recently passed through London, on an official visit to Germany as a Scientific Officer.

AN INVESTIGATION OF THE CONSTITUTION OF CERTAIN FOUNDRY BONDING CLAYS*

Determination of the mineralogical nature of a clay by simple laboratory methods

By R. W. GRIMSHAW, B.Sc., and A. L. ROBERTS, Ph.D.

Introduction

The modern tendency to more precise control of the properties of foundry sands has resulted in the increased employment of synthetic rather than naturally bonded sands. The synthetic sand is prepared under technical control and consists essentially of two parts, namely, a carefully graded sand and a regulated amount of some bonding agent, usually a type of clay. The purpose of the investigation described in this Paper was to establish the nature of the principal mineral constituents of certain clays which have proved successful in practice as bonds for foundry sands, and to bring to the notice of those concerned with moulding sand bonds some relatively simple laboratory methods by which the broad features of the mineralogical nature of a clay may be determined comparatively rapidly, and without recourse to elaborate equipment.

The principal clay minerals may be classified broadly into groups. Two groups from the classification, according to R. E. Grim,[1] are assembled in Table I and show the essential differences in the nature and properties of the different mineral types.

TABLE I.—*Grouping of Clay Minerals.* (*Grim.*)

	Properties.	Typical Members and Ideal Composition.
1. Kaolinite Group	Highly refractory. Plasticity and binding strength relatively low. Particles not broken down by working with water.	Halloysite .. Kaolinite .. Nacrite .. .. Dickite .. .. $Al_2O_3 : 2SiO_2 : 2H_2O$
2. Montmorillonite Group ..	Less refractory. High plasticity and binding strength. Crystals absorb water and are broken down to give much smaller ultimate particles than for Group I.	Beidellite .. $Al_2O_3 : 3SiO_2 : nH_2O$ Montmorillonite .. $Al_2O_3 : 4SiO_2 : 4H_2O + nH_2O$

Clays Used in the Investigation

Most of the work was carried out on materials representing the Kaolinite and Montmorillonite types of bonding clays, as follows:—

(1) Wyoming Bentonite; (2) Colbond—a mineral mined by the Cloyne Mineral Co., Irish Free State; and (3) Kaolinite (purified china clay). The ultimate composition of the clays, as determined by the usual analytical methods, is shown in Table II.

Although it is an essential determination when the constitution of a clay is being worked out, the chemical analysis, taken by itself, gives little or no definite information about the nature of the constituent minerals, unless the material consists largely of one specific type. In general, clays are mixtures of several minerals, although one may predominate, and the total amount of silica and alumina obtained on analysis may thus be derived from several different sources. For example, quartz is a common constituent of clays, and is frequently present in relatively large amounts, and thus may be responsible for a considerable proportion of the "total silica" content. Similarly, the different alumino-silicate minerals may each contribute their quota to the total alumina and total silica values.

The chemical analysis suggested that the free silica content of Colbond was considerable, and examination under the microscope confirmed that quartz was in abundance. The content of quartz was therefore determined separately by using L. J. Trostel and D. J. Wynne's method,[2] in which alumino-silicate and accessory minerals are removed by selective chemical action, leaving the crystalline silica as residue. The average quartz content of Colbond clay was found to be 31 per cent. The molecular ratio of silica/alumina, after due allowance for quartz, was 2.8 to 1, which gave a first indication that the clay mineral, if one were predominant, was not of the montmorillonite type. No further information, however, could be obtained from the chemical data, and alternative methods were necessary for the identification of the type of clay mineral present.

* Paper presented by Dr. A. L. Roberts at the 42nd annual meeting of the Institute of British Foundrymen, held in London, June 15 and 16, 1945. The report of this investigation is communicated by the Bradley-Foster Research Laboratory under the direction of Dr. J. E. Hurst. The investigation has been carried out in the Ceramics and Refractory Materials Section of the Department of Coal, Gas and Fuel Industries (with Metallurgy) of the University of Leeds, under the direction of Dr. A. L. Roberts, by R. W. Grimshaw, B.Sc.

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Identification of Mineral Constituents

Attempts at more precise identification of the constituent minerals were made by means of the methods developed during the study of the constitution of a wide range of refractory and other clays now in progress in the Refractory Materials Section of the Fuel Department of the University of Leeds. These methods are mainly physical in character, and their details are to be described in separate publications. The principal method used was that of thermal analysis which is being extensively employed in clay constitution work[3] and which is now recognised as a valuable tool for this purpose. Only a brief description of the thermal analysis principle will be given in the present Paper. The Leeds technique is relatively simple and in many cases allows the proportion of the minerals to be estimated with some precision.

TABLE II.—*Chemical Composition of the Clays.*

	Bentonite. Per cent.	Colbond. Per cent.	Kaolinite. Per cent.
Moisture at 105 deg. C. ..	13.00	5.64	—
Loss on Ignition at 900 deg. C.	5.00	9.13	14.14
Total SiO_2	49.40	59.43	44.57
Al_2O_3	20.40	16.82	37.28
Fe_2O_3	3.70	4.15	0.66
TiO_2	0.40	1.60	0.00
CaO	1.80	1.25	1.21
MgO	2.55	0.31	0.05
K_2O	1.55	0.19	0.58
Na_2O	2.15	0.82	1.58
Total	99.95	99.34	100.07
Refractoriness by standard Cone Test	1,430 deg.	1,530 deg.	1,785 deg.

In this method the characteristic thermal changes which take place when certain types of clay minerals are heated are used as a basis of identification. Thus, kaolinite shows a pronounced heat absorption in the range 500 to 800 deg. C., the maximum occurring at 590 deg. C.; this change is associated with the decomposition of the kaolinite molecule and the evolution of water from the crystal lattice. Montmorillonite shows a similar but somewhat less pronounced effect at a rather higher temperature (*e.g.*, maximum at 720 deg.). Both types of mineral undergo heat evolution at higher temperatures; in kaolinite the exothermic effect is sudden and pronounced at 980 deg. In montmorillonite it is less marked and occurs at a somewhat lower temperature. A number of other minerals are also characterised by thermal changes. The temperature and degree of the effects are considerably influenced by experimental conditions which, therefore, need strict standardisation. The method at present is largely empirical, and its successful application in clay constitution work depends on the availability of a range of pure mineral types with which the apparatus may be calibrated.

A weighed sample (*e.g.*, 0.8 gm.) of powdered clay is heated side by side with a similar weight of inert material (preferably the same clay previously calcined) under carefully controlled conditions of rate of rise in temperature. Thermocouples embedded in the test sample and in the inert material are connected in opposition, so that any E.M.F. recorded results from a difference in temperature between the two materials, corresponding either to an evolution or an absorption of heat in the sample under test. The

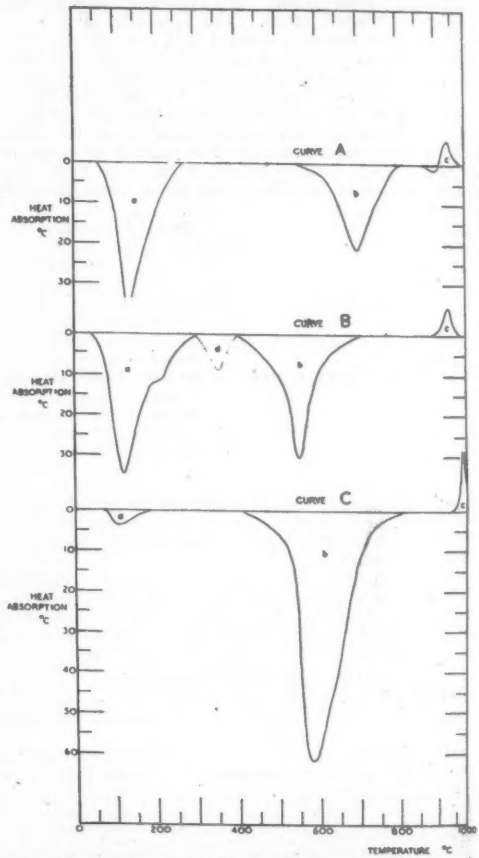

FIG. 1.—THERMAL ANALYSES CURVES OF CLAYS. A, WYOMING BENTONITE; B, COLBOND; C, KAOLINITE.

apparatus is arranged so that these out of balance voltages are recorded on graph paper and are ultimately plotted against a horizontal temperature base. Areas above the zero line represent heat evolution, whilst those below the zero indicate heat absorption.

Typical differential thermal analysis curves for air-dried bentonite, Colbond and pure kaolinite are shown in Fig. 1, curves A, B and C respectively. In all cases, the area marked (*a*) in Fig. 1 represents heat absorbed by the evaporation of hygroscopic moisture from the clay. It is normally relatively large for minerals or clays of the bentonite type. The characteristic peaks in the curves for the three types of clay materials are explained in Table III.

TABLE III.—*Critical Points of Thermal Analysis Curves in Fig.* 1.

Area.	Bentonite Curve A.	Colbond Curve B.	Kaolinite Curve C.
(*a*)	Evolution of hygroscopic moisture.	Evolution of hygroscopic moisture.	Evolution of hygroscopic moisture.
(*b*)	Decomposition of montmorillonite molecule (characteristic).	Decomposition of kaolinite-type mineral.	Decomposition of kaolinite molecule (characteristic).
(*c*)	Heat evolution (not specific) preceded by small heat absorption.	Heat evolution probably modified by presence of accessory minerals.	Heat evolution (characteristic).

Tests were also made on a number of different Colbond samples representative of the run of the mine. The broad features were essentially similar and the samples differed mainly in respect of the accessory minor constituents, in particular the iron-bearing minerals. The area "*d*" under the dotted line (curve B, Fig. 1) shows a modification of the general Colbond curve obtained with one particular sample of relatively high iron content. This area was due to an appreciable amount of hydrated ferric oxide. In some other cases no thermal effect was observed at this point, the iron being present as unhydrated Fe_2O_3.

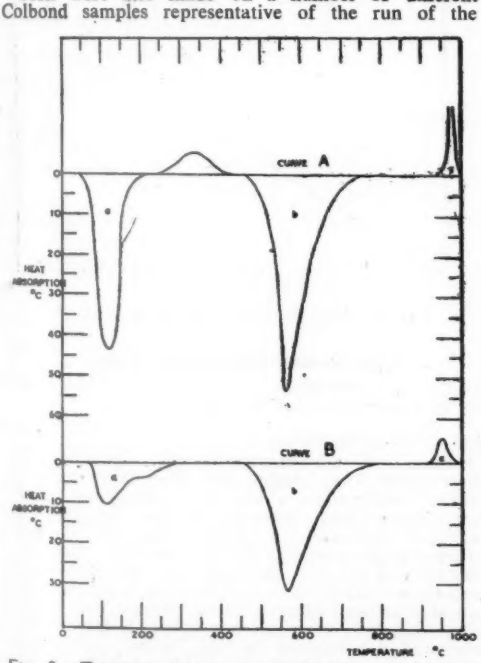

FIG. 2.—THERMAL ANALYSES OF CLAYS. A, HALLOYSITES; B, SCOTTISH CLAY.

Discussion of Thermal Analysis Data

The curves in Fig. 1, together with a number of other determinations not included here, showed that the principal mineral in the Colbond clay most probably belonged to the kaolinite class. It should be noted at this point that the endothermic and exothermic areas in curve B (Fig. 1) are considerably less than those of the kaolinite curve C, because in the latter the test sample consisted entirely of kaolinite, whereas in the former only about 40 per cent. of the mineral was present, the remainder being quartz and accessory matter. There was no evidence of any mineral of the montmorillonite type. It will be noticed that the exothermic area "*c*" does not correspond in respect of size or temperature with that of the standard kaolinite curve. This effect is generally found with most clays of this type, and has been established as due to the lower proportion of the principal mineral, and also to interference from associated impurities.

A careful comparison of the curves for Colbond and kaolinite showed, however, that there were certain points of difference as regards the shape of the curve and the temperature of its peaks. Fig. 1 shows that the area (*a*) which corresponds to the heat absorbed in removing hygroscopic water, is much greater than that of kaolinite and, in fact, resembles that of bentonite. The implication is that, since all the materials in question were air-dried before testing, the Colbond clay had a greater affinity for water than had kaolinite, in that not only was more water held in the clay, but also that the clay had to be heated to a higher temperature before the water was completely removed.

The second point of difference is seen in the endothermic areas marked "*b*" in curves B and C. For Colbond this area is narrow in relation to its depth and the peak occurs between 560 and 565 deg. C.; for kaolinite the area is somewhat broader, and the peak occurs at 590 deg. These differences have been encountered consistently during the examination of a

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wide range of refractory and other clays, and point unmistakably to the fact that the principal mineral in Colbond, and in many plastic fireclays and ball clays, is in some way different from that in china clay.

Thermal analysis and other tests on minerals of the kaolinite group suggest that the mineral resembles halloysite, which is identical in composition with kaolinite, but which has been shown by electron microscope methods to differ strikingly from the latter in respect of the crystal size and habit. The recent and most important work of Alexander, Faust, Hendricks, Insley, and McMurdie[4] has shown that the halloysite crystals occur as thin laths, in which the

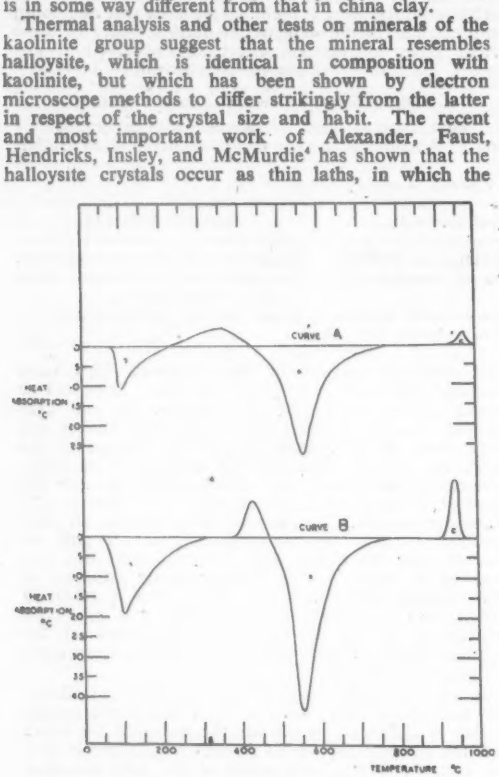

FIG. 3.—THERMAL ANALYSES OF CLAYS. A, BALL CLAY; B, YORKSHIRE CLAY.

length is of the order of 10 to 20 times the width. Kaolinite crystals are flat plates having lengths and widths of approximately the same order and of about the same length as the halloysite laths. It follows, therefore, that the surface area presented by a given weight of halloysite is much greater than for kaolinite, and on this account it might be expected that the affinity for holding and retaining water, the plasticity and the bonding strength of halloysite would correspondingly be greater than for kaolinite.

A first indication that this is the case has been obtained from limited and small-scale measurements of the dry transverse strengths of sand mixes bonded with 5 per cent. of kaolinite and halloysite respectively. For the same initial water content, the dry strength of the halloysite mixes were four times those of the kaolinite. Unfortunately, sufficient halloysite to carry out a complete series of full-scale tests has not yet been secured. Fig. 2 gives the results of thermal analysis tests made on a sample of halloysite of American origin (curve A), and it is significant that, of all the minerals so far examined, this was the only one to reproduce the particular characteristics found in Colbond and other plastic clays. There seems little doubt that the principal mineral in these clays is fundamentally different from kaolinite, and appears to resemble halloysite.

Fig. 2 also includes thermal curves given by a moulding-sand bond clay of Scottish origin (B), and in Fig. 3 are shown curves for a North Devon ball clay (A) and a Yorkshire clay (B). All these curves show the features which appear to be characteristic of halloysite, although close analysis indicates the presence of other kaolinite-group minerals in certain cases.

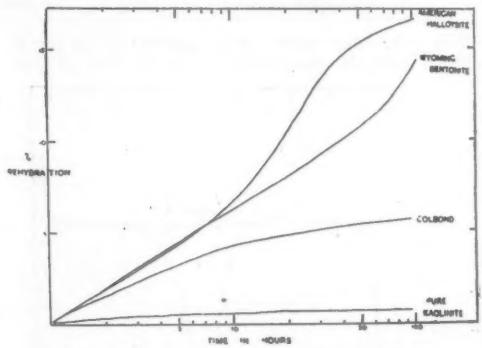

FIG. 4.—REHYDRATION CURVES OF CLAY.

Supplementary Identification Tests

Additional identification methods used in this work may be briefly described as follows:—

Microscopic Examination.

Minerals of the montmorillonite type may be differentiated from kaolins and other minerals by a staining technique in which, after preliminary treatment with acid and subsequent washing, the clays are stained by dyes such as crystal violet and the fine particles examined under the microscope. The acid treatment alters the colour after staining differs from that of kaolinite when similarly treated, the latter being unaltered as regards *p*H. Thus bentonite and montmorillonite become brilliant yellow when dyed with crystal violet, whilst kaolinite retains the violet colour of the dye. Full details of this technique have

been published by G. T. Faust.[5] Microscopic examination of Colbond revealed no trace of montmorillonite. The majority of the Colbond materials carried the blue-violet colour which might indicate a mineral of the kaolinite group.

Rehydration Studies.

Information of value in the identification of clay minerals may often be obtained by a study of their rehydration properties.[6] The method involves preliminary heating of the substance to approximately 300 deg. C., and then determining its regain in weight when placed in a water-saturated atmosphere at room temperature. Curves as given in Fig. 4 are for pure kaolinite, standard Colbond and Wyoming bentonite, showing the absorption of water over a period of 100 hours.

The amount of water reabsorbed in the case of Colbond was considerably in excess of that absorbed by pure kaolinite, but was less than with bentonite. In view of the substantial difference between the behaviour of Colbond and kaolinite in this test, and because of other differences revealed in the differential thermal curves, it was considered desirable to include in Fig. 4 the curve of rehydration for halloysite. Colbond reabsorbed water at approximately half the rate of the sample of halloysite but the shape of the two curves was similar and the rates of rehydration after 100 hours were almost identical. Bentonite, on the other hand, still had the power of taking up more water at a substantially greater rate.

Density Measurement.

Whilst there is some doubt as to the precise value of the true specific gravity of halloysite, the bulk of published data indicate that it is appreciably less than that of kaolinite. A recent American determination gave the figure of 2.2 gm./cu. cm. Measurements on Colbond, after due allowance for impurities, showed that the specific gravity of the clay-mineral constituent was 2.35, a value in striking contrast to that of 2.66 which was obtained for kaolinite under the same experimental conditions.

Approximate Mineral Constitution of the Colbond Clay

Table III summarises the results of the work on the constitution of this particular clay, and represents an approximate "balance-sheet" derived from the chemical and thermal analyses. The values for minor constituents are obviously open to some doubt, as they are based for the most part on chemical data alone, which involves the assumption in some cases that the constituents are present as indicated.

With regard to the major constituents, the value of 40 per cent. of a kaolinite-type mineral (Al_2O_3: $2SiO_2$:$2H_2O$) accounts for all but 1 per cent. of the total alumina as determined by chemical analysis. Although this apparent excess of Al_2O_3 could just be attributed to experimental error in the thermal analysis measurements, it seems likely that it is real and is derived from accessory minerals of the felspar type whose presence eludes detection by thermal methods. Similarly, the total silica content is not completely accounted for on this basis, as there is an apparent excess of some 3.8 per cent. after due allowance for that derived from the principal mineral, quartz and felspars. This excess lies outside the probable limits of experimental error and so would appear to indicate the presence of a little amorphous silica.

TABLE IV.—*Rational Analysis of Colbond.*

Mineral or Constituent.	Per cent. by weight.	Hyg. H_2O.	Proportion of Radicals Derived from Individual Minerals.									
			Loss on Ignition. H_2O.	Loss on Ignition. CO_2.	SiO_2.	Al_2O_3.	Fe_2O_3.	TiO_2.	CaO.	MgO.	Na_2O.	K_2O.
Kaolinite-type clay mineral C possibly halloysite) ..	40	—	5.6	—	18.6	15.8	—	—	—	—	—	—
Quartz	31	—	—	—	31.0	—	—	—	—	—	—	—
Felspars	8	—	—	—	5.5	1.6	—	—	—	—	0.8	0.2
Hydrated Fe_2O_3 ..	5.5	—	1.3	—	—	—	4.2	—	—	—	—	—
Calcite	2.3	—	—	1.0	—	—	—	—	1.25	—	—	—
TiO_2	1.6	—	—	—	—	—	—	1.6	—	—	—	—
$MgSiO_3$	0.8	—	—	—	0.5	—	—	—	—	0.3	—	—
Amorphous SiO_2..	3.8*	—	—	—	3.8*	—	—	—	—	—	—	—
Hygroscopic water	5.6	5.6	—	—	—	—	—	—	—	—	—	—
Organic matter ..	1.2	—	1.2*		—	—	—	—	—	—	—	—
Total	99.8	5.6	9.1		59.4	17.4	4.2	1.6	1.25	0.3	0.8	0.2
Amounts by chemical analysis ..	—	5.6	9.1		59.4	16.8	4.2	1.6	1.25	0.3	0.8	0.2

* By difference.

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The lime content of Colbond is probably due to calcite, small amounts of which were identified in bulk samples of the clay. Following the common procedure in rational analysis, the alkali content has been ascribed to albite and orthoclase felspars in proportion to the respective Na_2O and K_2O contents, and the MgO to $MgSiO_3$. The presence of organic matter in several of the samples was confirmed by thermal analysis, but the amount present could not be accurately estimated. The relative absence of alkali and alkaline-earth radicals in the Colbond sample presumably accounts to no small degree for its acknowledged high refractoriness when used as a foundry bonding clay.

Summary

Some of the methods available for the identification and estimation of the principal constituent minerals in clays are briefly described. By their means the constitution of a particular foundry bonding clay (Colbond) was studied in detail. This material was found to contain approximately 40 per cent. of a kaolinite-group mineral, together with 31 per cent. of quartz as the principal impurity; the rest of the clay consisted of various accessory minerals, the possible nature and amounts of which are indicated.

The principal mineral in Colbond, and in other bond and refractory clays, was found to differ from kaolinite, and the evidence suggests that it resembles halloysite, a mineral whose plasticity and bond strength are probably greater than those of kaolinite and some other members of this group of clay minerals.

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PUBLICATION RECEIVED

"Cast Iron in the Chemical and Process Industries." By F. L. La Que. Published by the Gray Iron Founders' Society, Inc., 1201, Nineteenth Street, Washington, D.C., U.S.A. (Price $1.)

This brochure carries a quoted slogan—"the most important material of construction in chemical engineering." The major portion of the book is taken up with tabular matter designed to show just what plain, austenitic and high-silicon cast iron have accomplished. The tables take up no fewer than 19 pages, and must represent many thousands of tests. The actual letterpress only runs to five and a half pages, but is well worth reading. We shall be pleased to lend this copy to those foundries catering for this class of work on application to the Editor.

CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

"CONSISTENCY AND THE CUPOLA"

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—We have read with great interest the discussion printed in the JOURNAL dated July 5. Mr. Payne's remarks concerning the reliability of flow instruments may have been thrown out as a challenge to instrument makers. Whether this be so, or whether Mr. Payne is not up to date with his knowledge of flow metering, the true facts are that flow measurement of cupola-blast is regularly being measured with an accuracy of 99 per cent. It would appear that Mr. Payne's measurements were effected with the pitot tube, which is entirely inadequate apparatus for this job.

The only occasion when the pitot tube can be used reliably is when the air stream can be properly controlled by means of grids, guide vanes, and orifices; under these conditions the pitot tube, set in a fixed position, is accurate to 98 per cent. Apart from this, modern instruments can be relied upon to show *variations* in the flow of as little as ½ per cent.

We would also question the point made regarding the relation between volume and pressure. To a large extent these factors depend upon fan characteristics, and there are appreciable variations in results from various fans. In general, the volume is related to $\sqrt{P}$ (abs), which means that under cupola conditions a change of 1 per cent. in rate of flow is incurred by a pressure change of 8 in. w.g.

If we have misinterpreted Mr. Payne's observations, we should very much welcome his comments.—Yours, etc.,

(For Metronic Instrument Co., Ltd.)
H. A. HALLETT.

196, Grove Lane,
Smethwick, 40, Staffs.
July 9, 1945.

NATIONAL CERTIFICATES IN METALLURGY

From the secretary of the Joint Committee for National Certificates in Metallurgy (4, Grosvenor Gardens, London, S.W.1) there has been issued a pamphlet which outlines the scheme evolved for the functioning of this particularly important educational activity. One of its salient features is its flexibility—so oriented that local requirements are to be covered. Moreover, provision is made for the endorsement of higher certificates by the president of the Institute of British Foundrymen, where students have been successful in specialised foundry subjects.

MR. W. A. ARCHIBALD, technical manager of the Glenboig Union Fire-Clay Company, Limited, has graduated Ph.D. at Glasgow University (on June 22). The title of his thesis was "The Study of the Physical Constants of the Components of Steel Furnace Slags."

PRELIMINARY INVESTIGATION OF METAL POURING BY CINÉ RADIOGRAPHY*

By S. L. FRY

A method with great possibilities for the practical foundryman, the die caster, and the metallurgist

(*Continued from page* 216.)

DESCRIPTION OF CINÉGRAPHS

The cinégraphs shown are all positive prints of the fluorescent screen, and for the purpose of description can be divided into three tones, namely, light, medium and dark. The lightest tone, the area receiving the most X-rays, is the empty mould and runner shape. The surrounding area of medium tone is the sand comprising the remainder of the mould, whilst the almost black tones are the areas of metal.

All the moulds shown were run vertically with the exception of Fig. 7; in this case the core lay horizontally above the X-ray tube. The original size of all the moulds was 11 in. by 9 in., and they were all poured with L33 at 720 deg. C.

Cinégraphs Figs. 4A and 4B

(1) *Purpose.*—To observe effect of different operators pouring the casting.

(2) *Description of Mould.*—Bottom run wedge; $\frac{1}{8}$ in. square gate, and open top.

(3) *Time Details.*—Completely filled: A, $3\frac{1}{16}$ secs.; B, $4\frac{1}{4}$ secs.

(4) *Remarks.*—The efforts of numerous people, with instructions to pour normally, were recorded in this test. The first 20 frames, or just over the first second of the two extremes, are shown.

Group A shows the jet action of a fast pour, with its attendant severe turbulence. The enveloping of air by the runner stream and the large surface area subject to oxidation are also clearly shown. It will be noted that even when the mould is nearly half full, the jet still has sufficient force to reach the top of the mould and, as in the earlier frames, only falls back of its own weight.

Group B has a much more restrained pour and is probably as slow as could be run without a broken runner stream. Even in this case, however, the jet has sufficient power to force through the accumulating metal.

It may not be visible in the reproductions, although the effect is apparent in Group A, but the incoming stream can be seen as a darker area as it passes through the metal already in the mould. The stream is deflected and is particularly noticeable in Frame 15, Group A. It is too early to say why the stream is evident as an increased density.

Cinégraphs Figs. 5A and 5B

(1) *Purpose.*—To observe the effect of a swan-neck runner on different rates of pour.

(2) *Description of Mould.*—Swan-neck runner on piston casting with R.H. open riser.

(3) *Time Details.*—Completely filled: A, $4\frac{1}{16}$ secs.; B, $2\frac{5}{16}$ secs.

(4) *Remarks.*—A number of these comparisons were made; the two sets given typify the restraining action of the swan-neck runner found in these tests. The first ten frames of two runs, with marked differences in rate of pour, are shown, and it will be seen that, although there are differences before the metal passes the swan neck, the relative positions of the metal flow are almost identical in subsequent pictures.

Cinégraphs Figs. 6A and 6B

(1) *Purpose.*—To observe effect of venting.

(2) *Description of Mould.*—Two rectangles with a common runner, the right-hand casting having $\frac{1}{4}$-in. dia. vent from top right-hand corner. Both castings have $\frac{1}{4}$-in. by $\frac{1}{2}$-in. gate.

(3) *Time Details.*—Completely filled: Group A, $10\frac{1}{4}$ secs. for L.H.; $9\frac{1}{16}$ secs. for the R.H. Group B, $5\frac{5}{16}$ secs. for L.H.; $4\frac{9}{16}$ secs. for the R.H.

(4) *Remarks.*—The five frames taken as the casting was practically filled, show in each case how the air retards the flow of metal up the mould unless it is allowed to escape. The difference is more marked in Group B, because of the faster pour; the permeability of the sand not being sufficient for the rapid escape necessary. It is rather extraordinary, but in Group A the casting having a vent shows more gas bubbles than the other, and this aspect is at present under investigation.

Cinégraph Fig. 7

(1) *Purpose.*—To observe effect of horizontal pour and growth of shrinkage cavities.

(2) *Description of Mould.*—Circular plate with rimmed bore and edge, $\frac{1}{4}$-in. square gate.

(3) *Time Details.*—Completely filled in 12 secs. First shrinkage appears in 52 secs.

(4) *Remarks.*—These ten frames, taken at 10-sec. intervals, show the growth of shrinkage cavities. The last cavity to appear is, by reference to earlier pictures, situated at the end of the runner jet and not close to the gate. This demonstrates quite conclusively that the hottest metal is found at the main point of delivery in the casting and not at the immediate junction between the gate and the casting.

CONCLUSIONS

Undoubtedly the method has great possibilities, and will be of considerable use to the practical foundryman, the die caster and also to the metallurgist. It has been indicated that up to the present a very

* Paper read at the 42nd Annual Meeting of the Institute of British Foundrymen, held in London June 15 and 16. The Author is radiologist, Kent Alloys, Limited.

Metal Pouring by Ciné Radiography

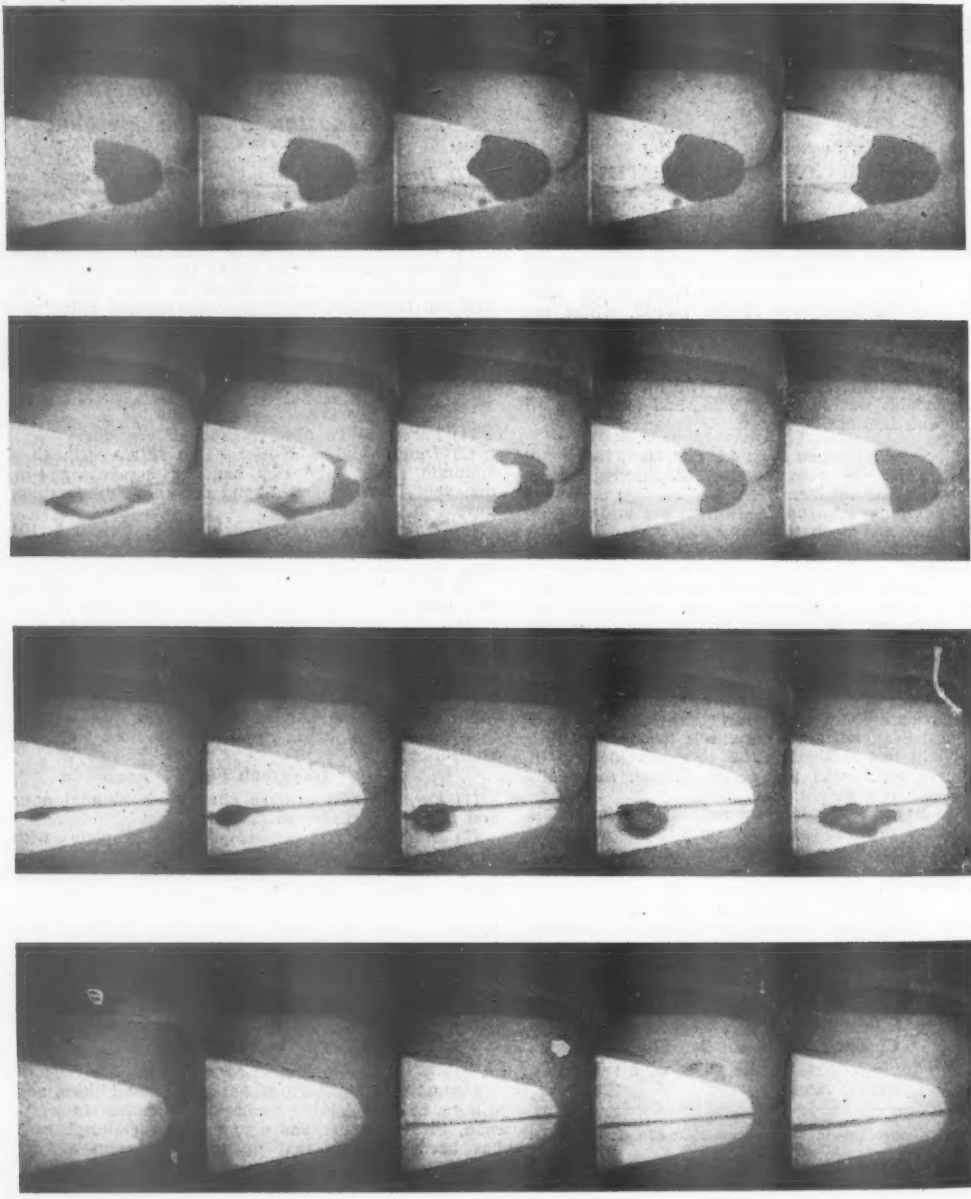


FIG. 4A.—SHOWS THE INFLUENCE OF THE HUMAN ELEMENT IN POURING.

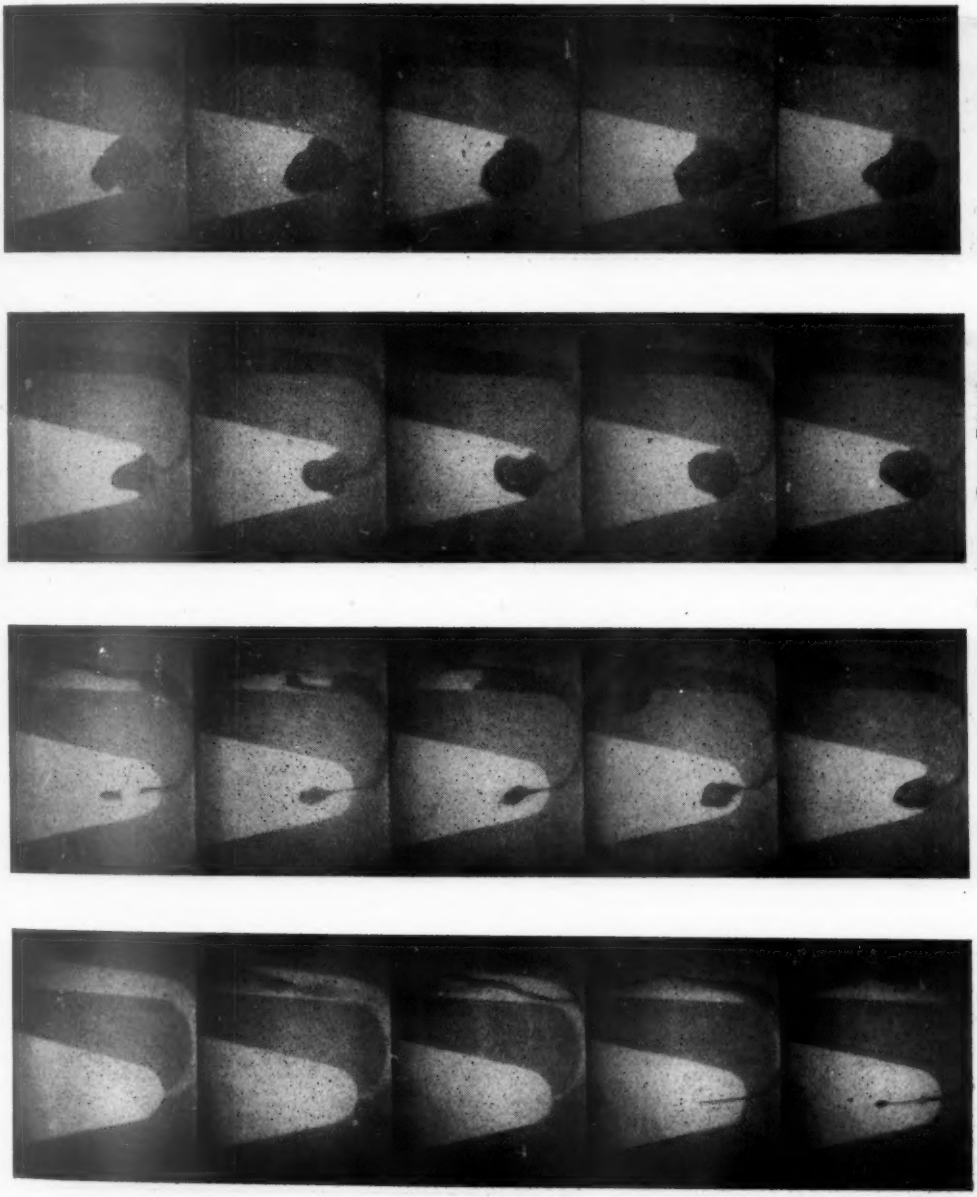


FIG. 4B.—SHOWING THE RESULT OF SLOW POURING.

FIG. 4A.—SHOWS THE INFLUENCE OF THE [illegible]

Metal Pouring by Ciné Radiography

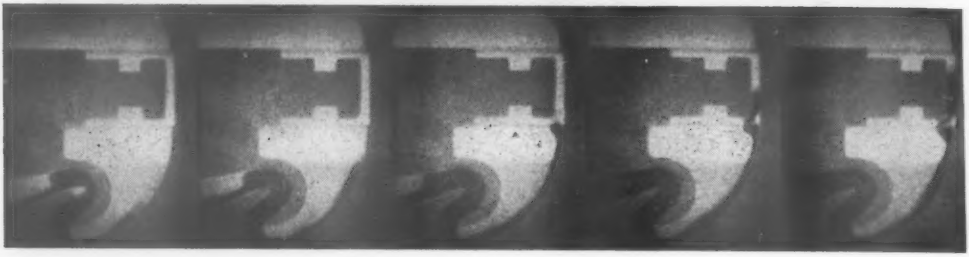
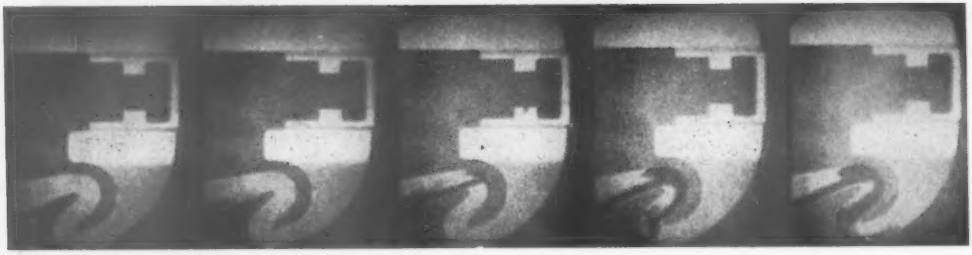


FIG. 5B.—IN THIS CASE THE POURING WAS FASTER.



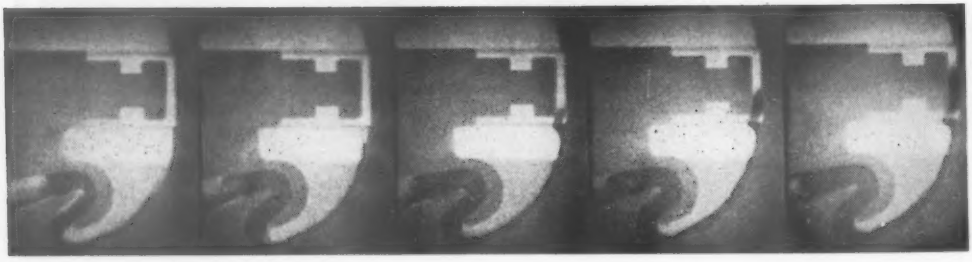


FIG. 5A.—EFFECTS GIVEN WHEN USING A SWAN NECK RUNNER.

FIG. 6A. — EFFECT RESULTING FROM VENTING.

FIG. 6B.—IN THIS CASE, FASTER POURING HAS BEEN USED.

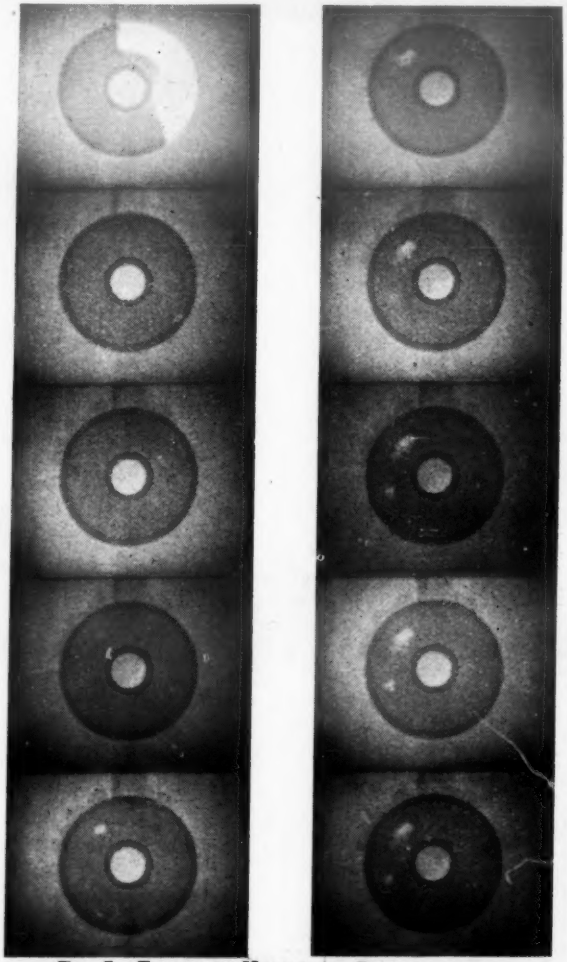


FIG. 7.—EFFECT OF HORIZONTAL POUR AND THE GROWTH OF SHRINKAGE CAVITIES.

Metal Pouring by Ciné Radiography

general line of investigation has been followed, but it is suggested that future work could more advantageously be done by dividing into two sections. The first, probably of greater importance in the long view, is the high-speed super-critical examination of thin layers of metal, with subsequent magnification of the results. The second, of more interest to the man who has got to make the casting, will be the development of the technique until much larger castings can be examined under production conditions. There is a promise of immense strides in X-ray output, in lenses, films, developers and fluorescent screens, each one of which will contribute appreciably to a widening of the scope of this definitely practical proposition. It may also be possible at a later date to amplify the screen brightness by means of television, and this will help even further in the future progress of the method.

In closing, therefore, although the present results have been of use and have shown what has often been surmised, the full possibilities of the technique are not even indicated. In the foundry alone it should help to raise the casting process to a much more exact science, whilst in testing and in general applications there does not appear to be any limits to its ultimate use.

The Author wishes to express his thanks to the directors of Kent Alloys, Limited, for permission to publish this Paper, and to Mr. F. H. Hoult, general manager, for his help and encouragement.

INCOME-TAX MATTERS OF CURRENT APPLICATION: SCHEDULE D

By FRED. J. TEBBUTT

This article covers all those salient points of the newer provisions, both legislative and administrative, and is thus a handy guide for easy reference at any time, that is for Schedule D (business profits; persons on own account). The present forms require return of income for the year ending April 5, 1945, but an earlier date can be substituted, according to the accounting year ending date of the firm concerned.

Payments for Excess Profits Tax and National Defence Contribution and premiums under the War Risks Insurance Act, 1939, are deductible as trading expenses; War Damage Act contributions and premiums are not. Interest received where War Damage contribution is paid in advance is assessable, but interest received on Treasury Tax Reserve Certificates (taken out in advance of tax payments) is not.

A firm joining another (that called the "nucleus firm") under a concentration of industry scheme, is taxable on the profits received from the nucleus firm, and it should be noted that wear and tear allowances continue for the displaced firm for machinery and plant of that firm, even though this may not have been used in the period under review.

An employer may contribute to the purchase of savings certificates by an employee, and that outlay is regarded as a trading expense and deductible if considered reasonable; generally speaking, the "powers that be" consider 10 per cent. of the full outlay reasonable for this deduction.

Ordinarily, gifts of goods to employees are not taxable, and if the limitation of supplies has made difficult such gifts so that in substitution savings certificates or other Government savings investments are given, these are not taxable on the recipient. Bonuses to employees, say, for instance, at Christmas, are, however, taxable on the recipient, but allowable to the employer as trading expenses. Allowances to employees (or their wives or children) while in the Forces are deductible as trading expenses. If rooms in business premises are let off, the rent received need not be returned, but an appropriate percentage of the full rent or annual value would be taken into account in allowing these items; roughly, under Schedule D letting furnished rooms is assessable, whilst letting unfurnished rooms is not assessable.

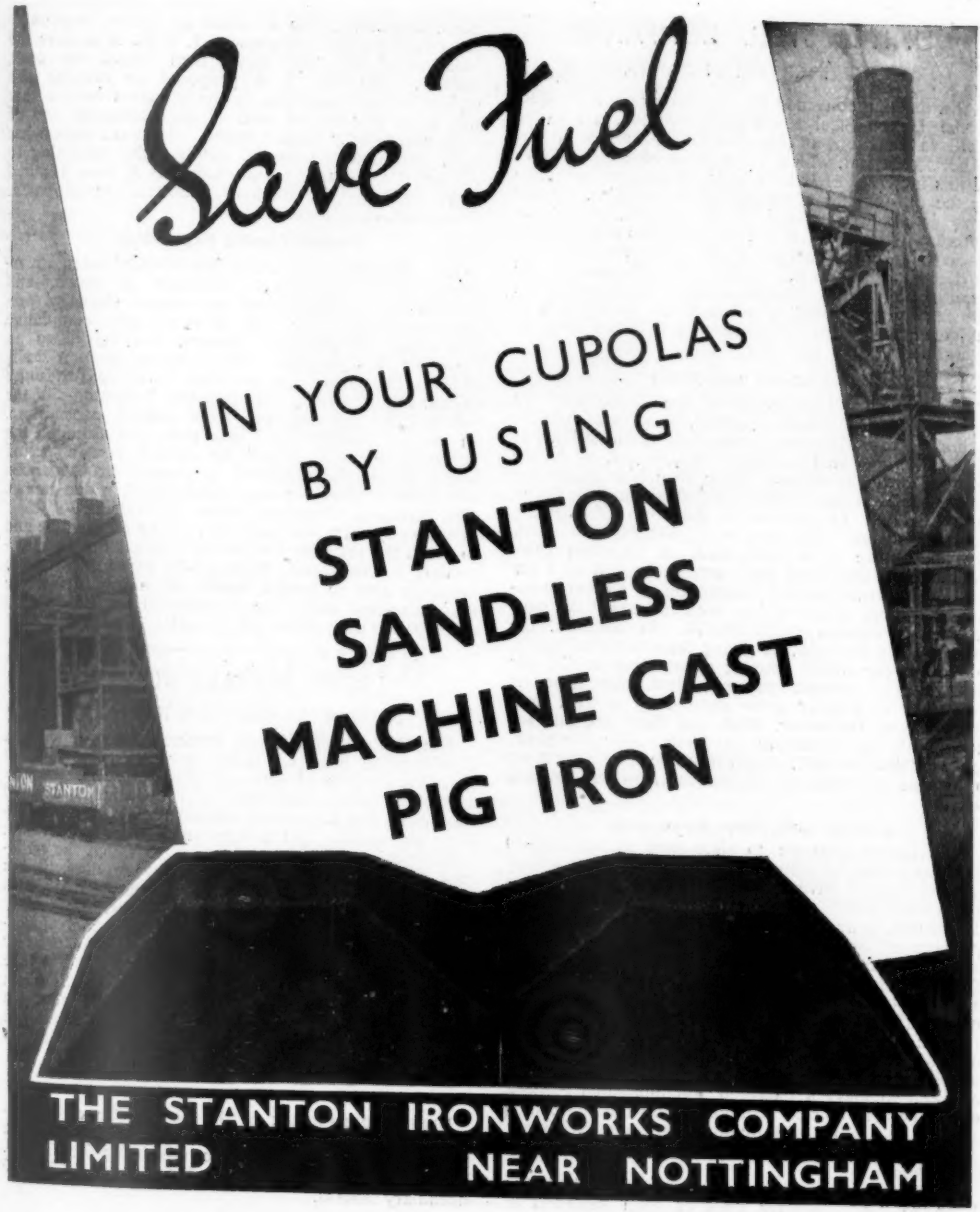
Deductible Items

Here are a few other items deductible; advertising costs, although in some cases outlay of a capital nature (*e.g.*, permanent signs and so forth) may not be accepted easily; cost of welfare schemes, hospital donations and the like if for the benefit of the employees (but ordinary charitable contributions considered private expenses and not allowable); and legal expenses if for trade purposes. Losses in one business can be set against profits in another business if under the same ownership. Scientific research expenditure whether of a capital nature or otherwise is now deductible under certain conditions.

The annual wear and tear percentages for machinery and plant (the term covers a wide field, including fittings and fixtures and motor vehicles) continue, and all the agreed rates are still subject to the additional one-fifth, as, for example, trade motor vehicles the ordinary rate is 20 per cent., add one-fifth, 4 per cent., and the total becomes 24 per cent. An additional allowance extra to the ordinary allowance may be obtained where machinery and plant are being worked overtime or continuously as against normal working in other times; individual circumstances must, of course, rule in these cases, but the following way give some guidance as to the extent of the addition. For commercial vehicles, where it is considered that the usual allowance is inadequate having regard to wartime running of the vehicles, an increase over and above the usual amounts of one-quarter additional applies generally.

There is also another allowance applying to buildings, machinery and plant provided since January 1, 1937, the conditions being that with the end of the war the premises may be redundant or have depreciated in value; if these requisites are considered likely to be fulfilled, a yearly deduction on account may be obtained currently.

Other allowances—for new buildings, machinery and plant and for patent rights—are provided for in the Income-Tax Bill before Parliament, but these are matters for the future.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THE STANTON IRONWORKS COMPANY
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NEAR NOTTINGHAM

UNITED STEEL COMPANIES

LARGE INCREASE IN CAPITAL

At a meeting convened for July 30 next shareholders of the United Steel Companies, Limited, are to be asked to sanction an increase of £5,500,000 in the authorised capital, which will thus become £16,000,000. Of this increase, £1,500,000 is to be applied in replacing the outstanding £1,500,000 of 4½ per cent. 10-year notes with a like amount of 4½ per cent. cumulative preference shares which will be offered to shareholders for cash at par. The notes are due for redemption on December 15, 1948, but may be redeemed in the meantime on three months' notice at 101 per cent. The remaining portion of the authorised capital is to be issued as ordinary preference or deferred stock as determined by the directors.

Debentures and Notes

In a circular to shareholders, the directors of the United Steel Companies, Limited, point out that the authorised capital of the company at its formation was £6,650,000, of which £6,616,365 was issued, all in the form of ordinary shares. Since then, the authorised capital has been increased to £10,500,000 and the issued capital is now £10,194,000 in the form of ordinary stock or shares. An issue of £2,500,000 first mortgage debenture stock was made in October, 1934, secured by a trust deed and carrying interest at 4 per cent., with provisions for redemption by annual drawings, the effect of which has been to reduce the outstanding debentures to £2,058,674. In addition, the company has the right, on giving three months' notice, to redeem the whole amount outstanding at 102 per cent. on any interest payment date. An issue of £1,500,000 4½ 10-year notes secured by a trust deed was made in December, 1938, and these are due for redemption on December 15, 1948. The company, however, has the right, on giving three months' notice, to redeem the issue at 101 per cent. on any interest date.

Colliery and Other Investments

The circular goes on to state that in the last 10 years outgoings on capital account (including increased working capital) have exceeded the provisions for depreciation and obsolescence by approximately £10,800,000, towards which £5,610,000 was provided by issues of ordinary capital and 10-year notes. Of such capital outgoing, £3,541,000 was made in respect of industrial investments, which included £1,183,876 for shares taken up in John Summers & Sons, Limited, and £2,085,000 for the purchase of colliery companies in South Yorkshire. The directors have acquired these collieries as a matter of policy in order to secure raw materials for the company's works, especially coking coal, and to make a balanced and integrated colliery unit. The area of coal occupied by all the company's collieries in South Yorkshire now covers approximately 42,000 acres, the output at present being 3,400,000 tons per annum.

In addition, when the company subscribed for £1,288,185 "A" ordinary stock of John Summers & Sons, Limited, it also obtained an option, exercisable at any time prior to February 1, 1946, to acquire the balance of the "A" stock then issued for cash, namely, £999,999. It is proposed to exercise this option before that date, as the directors believe that this is in the interest both of their company and of John Summers & Sons, Limited. After the option has been exercised, the special voting rights attaching to the one "A" share in John Summers & Sons, Limited (subscribed by the Bankers' Industrial Development Company), will lapse.

Further Capital Expenditure

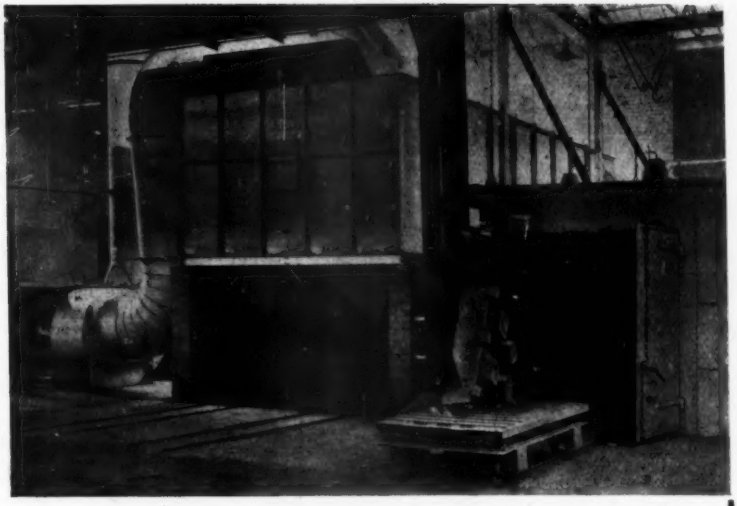
It is clear that the £1,500,000 10-year notes are represented by permanent increases in assets, and accordingly it is proposed to replace them by permanent capital in the form of 4½ per cent. cumulative preference shares. The Treasury has agreed to an issue for this purpose. The directors think it desirable at the same time to make provision for future capital requirements. The post-war programme of the heavy industries involves large capital expenditure. In this the company will take part, and although the expenditure involved will be spread over a period which cannot be predicted in present circumstances, it will be necessary to raise more capital in due course. The directors, therefore, both as evidence of their intention to carry out their part of the programme and to avoid the necessity for further applications to shareholders to authorise increases in capital, invite the members now to pass a special resolution to increase the authorised capital to £16,000,000 by the creation of 5,500,000 new shares of £1 each.

LIGHT METALS PLANT

NOW AVAILABLE FOR PURCHASE

The Ministry of Aircraft Production announce that consideration has been given to the disposal (subject to existing rights of option or first refusal) of surplus specialised plant provided at Government expense during the war for rolling, extruding, forging and casting light metals. As a light metals fabricating unit consists essentially of heavy plant, to which the buildings afford protection and ancillary services, it has been decided that, both for plant alone and for units comprising plant and buildings together, the normal method of disposal will be by outright sale. Industrialists who wish to acquire either complete units or individual items of plant are invited to apply to the Minist / of Aircraft Production (P.S. 10), Southam Road, Banbury, Oxfordshire, stating their needs in terms of type and capacity of plant required, and, in the case of complete plants, the area in which they would desire to be accommodated.

DURING THE COURSE of the war, J. Stone & Company, Limited, of Deptford, have produced more than 14 thousand million rivets, the bulk being for aircraft. The company have also turned out some 28,300,000 incendiary bombs.



Efficient Dust Control

The dust from these Shot Blast rooms is exhausted to a large Tilghman V-screen Dust Arrester, ensuring that the operator, wearing Tilghman protective equipment, works in perfect safety and has a clear view of his work. Dust Arresting systems which comply with the requirements of the Factory Act can be supplied to deal with all types of dust nuisance in industry. Write for our catalogue.

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H.45

PERSONAL

LORD BENNETT has been elected president of the Royal Society of Arts for the ensuing year.

MR. RAYMOND CHARLES MAHER has been appointed a director of Ward & Goldstone, Limited.

MR. GERARD YOUNG has been appointed a director of the A.B.C. Coupler & Engineering Company, Limited.

MR. R. A. BLAKEBOROUGH, managing director of J. Blakeborough & Sons, Limited, valve specialists, Brighouse, Yorkshire, has been appointed chairman of the company.

MR. W. T. VIZER HARMER has been released from his post of Controller of Chrome Ore, Magnesite and Wolfram from June 30. Mr. Harmer will continue to act as adviser to the Ministry of Supply.

MR. ARTHUR R. KNOWLES has been appointed Director of the Joint Iron Council, a national body formed recently by the producers of foundry pig-iron and the Council of Ironfoundry Associations.

MR. LEWIS J. B. FORBES has relinquished his position as Regional Controller and chairman of the Scottish Regional Board under the Ministry of Production, in order to return to industry. He is succeeded by Major Jackson Millar, Regional Controller, Ministry of Supply, who will continue in that capacity in addition to that of his new appointment. The Ministry of Production also announces that MR. W. W. S. ROBERTSON has relinquished his position as Regional Controller and chairman of the North Midland Regional Board, and has been succeeded by MR. GEORGE H. SPENCER, J.P., former Regional Controller, Ministry of Aircraft Production, at Bristol.

MR. ELLIS HUNTER, deputy chairman and managing director of Dorman, Long & Company, Limited, Middlesbrough, has been appointed president-elect of the British Iron and Steel Federation, to take office in 1946, in succession to Sir Alan Macdiarmid. Although it was as recently as January, 1938, that Mr. Hunter joined the board of Dorman, Long & Company, as deputy chairman, shortly afterwards taking over the additional duties of managing director, he has had a long association with the iron and steel industry. He was formerly a partner in Peat, Marwick, Mitchell & Company, and in that capacity he was very actively identified with the interests of the iron and steel trade and the heavy industries of the North-East Coast. Mr. Hunter, who was recently elected first chairman of the British Steel Producers' Conference, is a chartered accountant and was elected Fellow of the English Institute in 1927.

Wills

KEITH, GEORGE, chairman and managing director of Keith Blackman, Limited, engineers £165,024

ROBINSON, JAMES, of Colwyn Bay, a director of Mather & Platt, Limited, engineers, Manchester £23,815

MR. LESLIE D. JEMMETT, who for some years had been joint managing director of Manley & Regulus, Limited, Showell Engineering Works, Wolverhampton, died recently.

FEWER DEFERMENTS FOR APPRENTICES

At present deferment on account of apprenticeship is virtually confined to engineering and shipbuilding occupations and to the building trade crafts. The numbers to be called up in the next few months are such that it seems to the Minister of Labour desirable on grounds of equity to curtail the grant of deferment of apprentices, and so reduce the number of older and fully skilled men who would otherwise have to be called up. The Minister has accordingly decided that the deferments of all apprentices, except those in building trade crafts, should be reviewed with a view to continuing deferment as apprentices only in the following cases:

(1) Those who were over the age of 18 on July 1, 1945, and (*a*) who are within 9 months of the end of apprenticeship or age 20, whichever is the earlier; or (*b*) who have obtained the ordinary National Certificate or its equivalent; or (*c*) who will be taking the examination for the certificate or its equivalent within 12 months of July 1, 1945.

(2) Those attaining the age of 18 on or after July 1, 1945, and (*a*) who have obtained the ordinary National Certificate or its equivalent; or (*b*) who will be taking the examination for the certificate or its equivalent within 12 months of attaining the age of 18.

To obtain deferment as an apprentice under (1)(*c*) or (2)(*b*), evidence will be required that the apprentice in a *bona-fide* candidate for the examination and has a reasonable chance of success.

The arrangements under which deferment of call-up can be accorded on industrial grounds will continue; and it is expected that some who would not qualify under the above rules, including a substantial proportion of those in shipyards, would continue to be deferred under the normal rules (N.S. 300 procedure).

HIGHER PRICES FOR SOME STEEL PRODUCTS

The Minister of Supply has made the Control of Iron and Steel (No. 42) Order, 1945, which came into force on July 12.

The Order increases the prices of wire nails, the thinner sizes of heavy plates, certain types of forging ingots and forgings and wire ropes; provides for an increase in the merchants' cutting margin on heavy steel bars and sections; and reduces the price of cemented, hard-metal finished tool tips.

Copies of the Order may be obtained from H.M. Stationery Office, or through any bookseller, price 1d: (S.R. & O., No. 814).

MR. J. C. COLQUHOUN, chairman and joint managing director of the Manganese Bronze & Brass Company, Limited, has joined the board of Lightalloys, Limited, and has been elected chairman in place of the late Mr. W. H. Grieve. MR. W. S. KNIGHT has been appointed managing director.

Design by Eric Fraser

MOSAICS OF STEEL

NUMBER FIVE

Rail production at Workington is integrated. West Coast hematite ores and other minerals mined locally, together with coke made in the vicinity are processed to produce the pure low sulphur and phosphorus irons. These irons are converted into steel by the Acid Bessemer process, a particular method which is unique for this country. Rails made from Acid Bessemer steel have inherent properties of wear resistance not found in steels made by other processes. Extra durability is further imparted by carefully controlled heat treatment (sorbitising). For these reasons the home railways use immense tonnages of Workington Acid Bessemer rails. The many large consignments for overseas railways are shipped direct from the Port of Workington

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THE UNITED STEEL COMPANIES LIMITED

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UNITED COKE & CHEMICALS CO. LTD., CUMBERLAND

THE ROTHERVALE COLLIERIES, TREETON
THE SHEFFIELD COAL CO. LTD., TREETON
THOS. BUTLIN & CO., WELLINGBOROUGH

USP.4

NEWS IN BRIEF

IN FUTURE, matters relating to the production and distribution of fireclay and silica refractories will be dealt with by the Raw Materials Department of the Ministry of Supply, Shell Mex House, London, W.C.2.

AT THE RECENT MONTHLY MEETING of the London Metal Exchange, the chairman, Mr. J. D. Wolff, forecast an early resumption of trading in copper and zinc. He said that a recent meeting with the Ministry of Supply was more encouraging than any previous meeting. At the outset trading would probably be confined to copper and zinc, as the lead and tin supply positions were more difficult.

THE TEXTILE MACHINERY MAKERS of this country had made a big contribution towards the winning of the war, said Mr. A. H. Lawton, chairman of Tweedales & Smalley (1920), Limited, at the annual meeting recently. Their company alone produced over nine million shells, 34,000 heavy bombs, two million noses for bombs, one and a half million smoke bombs, 6,000 mine sinkers, and over one million units of various other parts and assemblies.

MR. R. EWART, organiser of the National Union of General and Municipal Workers, addressing the half-yearly meeting of the council of the Cleveland miners at Middlesbrough, congratulated the ironstone miners on their "clean industrial record" during the whole period of the war. No major dispute, he said, had occurred between the owners and the men. A resolution was passed asking the Ministry to consider extra coal rations for the Cleveland miners owing to the inadequacy of the local gas supply.

MR. H. FRANCE, of Kettering, in his presidential address at the annual general council meeting of the National Union of Blast-furnacemen, Ore Miners, Coke Workers and Kindred Trades, held at Scarborough, declared that in the post-war period—and the earlier the better—"planned reorganisation of the iron and steel industry" must take place if the country was to hold its rightful place in this important industry. Mr. A. Callighan, general secretary, told the conference that little progress had been made with the claim for 14 instead of seven days' holiday with pay.

ADDRESSING SUNDERLAND ROTARY CLUB, Mr. J. Ramsay Gebbie, managing director of William Doxford & Sons, Limited, Sunderland shipbuilders, said it was tragic to him to hear the things sometimes said about profits and private enterprise. The Wear should be proud of the enterprise shown by the engineering and shipbuilding firms on the river. There were more private shipbuilding firms at Sunderland than in any other town in the country. Regarding profits, Mr. Gebbie declared that if the profits of Doxfords for the past 20 years had been distributed to the workers, they would only have been £3 a year better off.

PRESIDING AT THE annual meeting of the Barrow Hematite Steel Company, Limited, the Hon. Robert James (chairman and managing director) said that the life of their iron-ore mines in Cumberland was very limited. Efforts to be able to work a large and proved body of ore under the township of Cleator Moor failed through, he thought, the short-sighted opposition of certain local interests. The proposition they put before the Government authorities would, in view of the high prices that were being paid for freights and foreign ore, have been very profitable to the country at that time. The chances now of that ore ever being worked would seem remote.

WITH THE CORDIAL CO-OPERATION of the local education authority and headmasters, Head Wrightson & Company, Limited, engineers, of Stockton-on-Tees, have inaugurated a new scheme for the training of apprentices. It is proposed that boys on entering the employment of the firm should be given two months' experience in each of five departments. Boys will thereafter be free to make their choice and, subject to successfully passing an entrance examination, will begin their apprenticeship. In addition to his practical work, each boy will have the benefit of special day instruction at the local technical schools, with financial assistance to those who show merit by their progress at the evening classes.

DEALING WITH THE FUTURE of the steel industry in an address to the Darlington Rotary Club, Mr. W. D. Pugh, a director of the Darlington Forge, Limited, said that the steel trade must be regarded not as a separate entity, but in relation to all other fields of industrial activity. Mr. Pugh stated that controls during the war were to co-ordinate supply, production and distribution. Some sort of Government control must be expected in the post-war years. At one end of the scale they might have complete freedom from control of any kind, and at the other end some form of nationalisation. If the industry was to be free from the latter, it must show its ability to manage its own affairs, subject to the over-riding condition that the conduct of the industry was in no way prejudicial to the general welfare of industry or the community as a whole.

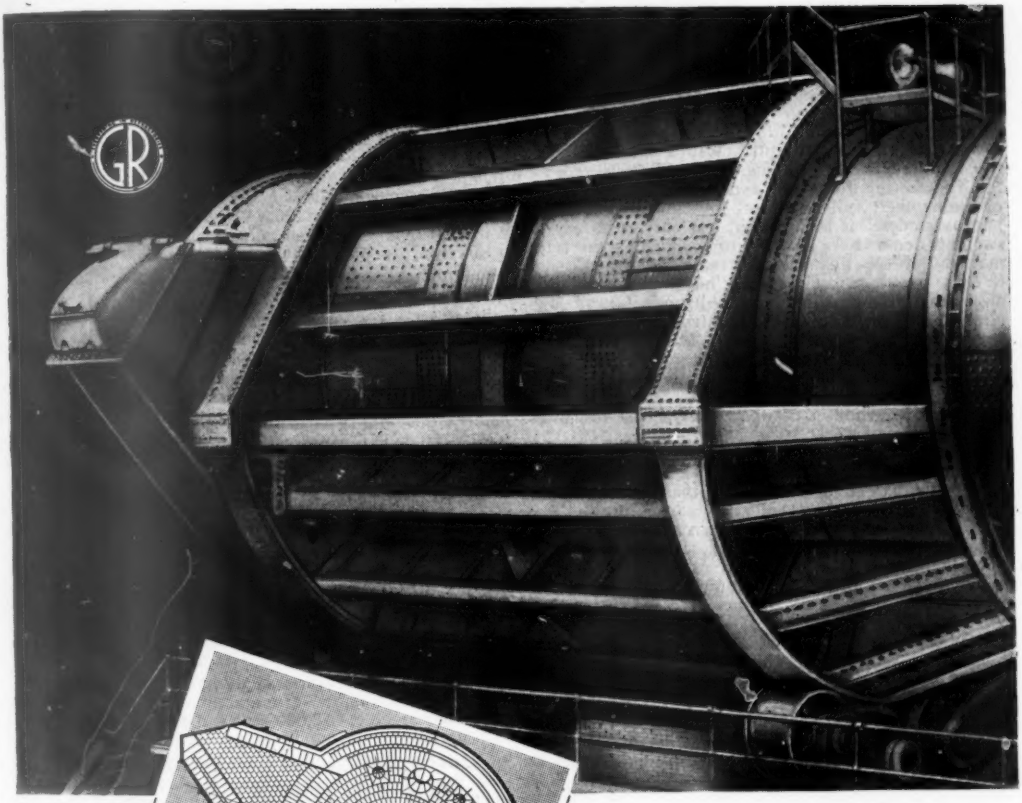
BOLT AND NUT CONTROL REVOKED

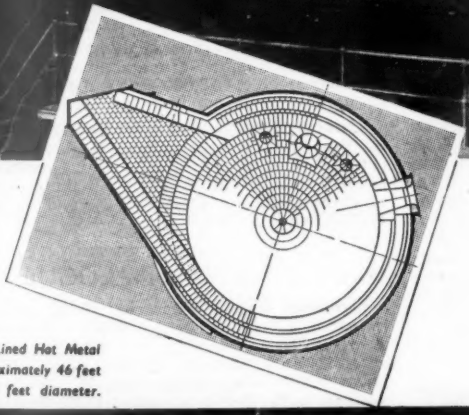
The Control of Bolts and Nuts, etc. (No. 8), Order, 1945, came into force on July 12. It revokes all previous Control of Bolts, Nuts, etc., Orders, and removes all restrictions on the acquisition and disposal of bolts, nuts, screws, screw studs, washers and rivets. The maximum price provisions of the revoked Orders are re-made in consolidated form.

Copies of the Order may be obtained from H.M. Stationery Office, York House, Kingsway, London, W.C.2, or through any bookseller, price 2d. (S.R. & O., No. 815).

PORTRAIT OF MR. JAMES HENDERSON

At the headquarters of the Iron and Steel Institute, in London, Sir Walter Benton Jones, chairman of the United Steel Companies, Limited, presented the Institute with a portrait by Oswald Birley of Mr. James Henderson, a past-president of both the Iron and Steel Institute and the British Iron and Steel Federation, in recognition of 50 years' service to the iron and steel industry. The portrait was accepted on behalf of the Institute by Mr. Arthur Dorman, the president.





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Raw Material Markets

IRON AND STEEL

Although still on a limited scale, the arrival of a few more cargoes of foreign ore has enabled blast-furnacemen to enrich the furnace charges, with a favourable effect on output. Rather more hematite has been released, though its use is still restricted, and the engineering foundries experience no difficulty in obtaining their full quotas of low and medium phosphorus grades. It is, however, less easy to satisfy the swelling demand for No. 3 iron, which is the staple material of the light-castings trade. Current output is fully absorbed and, as the housing drive gathers momentum, the need for increased production of high-phosphorus iron is clearly indicated. The chief impediment is the scarcity of fuel. More furnaces cannot be put into operation until a regular supply of coke is assured, and in the meantime the issue of licences for pig-iron has to be carefully controlled to avoid the interruption of operations at the foundries.

Production of sheet bars, billets, blooms, etc., has been stepped up to a high level and substantial deliveries are reaching the re-rolling mills. Such, however, is the extent of the demand that defectives and, in fact, any class of material which can be pressed into use, is eagerly absorbed. Few establishments are so fortunately placed as to boast stocks of more than inconsiderable proportions, and as the prospects of augmenting supplies by a resumption of imports is remote, the possibilities of increased home production are eagerly canvassed.

Shipbuilders generally claim to have sufficient work in hand to keep them fully employed for the next 18 months, but this apparent activity is not reflected in the weight of specifications reaching the plate and sections mills. This incongruity is explained by the shortage of labour. There is a dearth of skilled craftsmen, which is limiting shipyard activities, and this in turn exercises an adverse effect on the steel trade. Nor are the engineering trades as busy as they were in the war period, though strong support is still forthcoming from the builders of rolling stock. A few export orders have helped to improve the position at the plate mills, but light material is in more active request than heavy sizes. In contrast with the slow demand for heavy joists and channels, there is great activity at the mills rolling railway and colliery material, while sheet-makers are so heavily booked to the end of the year that they are refusing orders.

NON-FERROUS METALS

The non-ferrous metals industry is experiencing a brisk demand for its products and working to the full limit permitted by the present labour force. Manpower is the key to increased production rather than the provision of additional metal. Copper, zinc and other metals are in relatively good supply, but consumption is likely to rise slowly, in spite of the large potential demand for finished products. A steady improvement should, however, be registered as more men become available.

IRON AND STEEL SCRAP PRICES

(Delivered free to consumers' works. Plus 3¼ per cent. dealers' remuneration. 50 tons and upwards over three months 2s. 6d. extra.)

South Wales.—Short heavy steel, not ex. 24-in. lengths, 82s. to 84s. 6d.; heavy machinery cast iron, 87s.; ordinary heavy cast iron, 82s.; cast-iron railway chairs, 87s.; medium cast iron, 78s. 3d.; light cast iron, 73s. 6d.

Middlesbrough.—Short heavy steel, 79s. 9d. to 82s. 3d.; heavy machinery cast iron, 91s. 9d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 89s. 3d.; medium cast iron, 79s. 6d.; light cast iron, 74s. 6d.

Birmingham District.—Short heavy steel, 74s. 9d. to 77s. 3d.; heavy machinery cast iron, 92s. 3d.; ordinary heavy cast iron, 87s. 6d.; cast-iron railway chairs, 87s. 6d.; medium cast iron, 80s. 3d.; light cast iron, 75s. 3d.

Scotland.—Short heavy steel, 79s. 6d. to 82s.; heavy machinery cast iron, 94s. 3d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 94s. 3d.; medium cast iron, 77s. 3d.; light cast iron, 72s. 3d.

(NOTE.—*For deliveries of cast-iron scrap free to consumers' works in Scotland, the above prices less 3s. per ton, but plus actual cost of transport or 6s. per ton, whichever is the less.*)

NEW COMPANIES

(" *Limited*" *is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons,* 116, *Chancery Lane, London, W.C.2.*)

Gladwell & Greenhalgh, 150, Southampton Row, London, W.C.1—Founders, engineers, etc. £1,000. J. Greenhalgh and W. A. Gladwell.

Pannette Holloware, Paramount Works, Bridge Street, Accrington—Manufacturers of aluminium hollow-ware, etc. £2,000. J. and P. Owen, and J. and C. Barnes.

Carblox, Loxley, Sheffield—To take over those parts of the businesses of Thos. Marshall & Company (Loxley), Limited, and the Morgan Crucible Company, Limited, which consist of the manufacture and sale of carbon blocks. £100,000. A. and T. Marshall, J. Walker, and D. Dixon.

NEW CATALOGUE

Pyrometer Testing Furnace. Wild-Barfield Electric Furnaces, Limited, Elecfurn Works, Watford By-Pass, Watford, Herts, have used a four-page brochure to describe and illustrate a new piece of equipment. This is a thermocouple testing furnace, built to conform with British Standard Code No. 1041, 1943. It consists of an electric resistance furnace and a series of containers filled with materials of graduated melting points ranging from 232 deg. C. (tin) to 801 deg. C. (sodium chloride). A convenient auxiliary is a special immersion tube. The possession of this output removes just one more improvision in foundry control technique, and as such it is to be welcomed. The pamphlet is available to our readers on writing to Watford.